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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/757,934	01/15/2004	Gottimukkala Narendra Varma	HSF-007	6330

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EXAMINER	
FLORES, LEON	
ART UNIT	PAPER NUMBER
2611	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/20/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/757,934	VARMA ET AL.	
	Examiner	Art Unit	
	Leon Flores	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 January 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *6-9, 15 and 16* is/are allowed.

6)☒ Claim(s) *1,2,4,5,8,10,11,13,14,17 and 18* is/are rejected.

7)☒ Claim(s) *3 and 12* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 January 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *1/15/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities: In page 13, line 26 "Correlator 602" should be rewritten as "Correlator 604" as disclosed in figure 6. Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims (1, 8, 10 & 17) are rejected under 35 U.S.C. 103(a) as being unpatentable over Davies et al (hereinafter Davies) in view of Chen (US Publication 2005/0084025 A1).

Re claim 1, Davies discloses a data-aided method of tracking the timing offset between a transmitted signal having a training sequence and a received signal using a

pre-estimated timing offset, the method comprising the steps of: a. obtaining a corrected received signal using the received signal and the pre-estimated timing offset (See fig. 1: the output of element 12); b. obtaining a first estimate of the deviation in the pre-estimated timing offset out of a plurality of probable deviations (See fig. 1: the input of element 12) by performing the steps of: i. obtaining an expected signal corresponding to the first probable deviation using the training sequence (See col. 10, line 66 – col. 11, line 1, and col. 2, lines 39-54). The expected synch pattern is the training sequence); ii. calculating an error factor between the expected signal and the corrected received signal shifted through the first probable deviation (See col. 12, lines 9-20. This correlation will yield a timing correction signal. And if you see col. 2, lines 39-54, it teaches how the early, late and on-time samples are compared to a set of expected values in order to estimate and adjust the timing offset.); performing the steps i and ii for each probable deviation (See col. 2, lines 39-54. For each of the early, late and on-time samples a correlation will be performed to determine which of the samples better correlate with the expected set of samples); and iii. identifying the probable deviation yielding the optimum value of error factor as the first estimate of the deviation (See col. 2, lines 39-54. For each of the early, late and on-time samples a correlation will be performed to determine which of the samples better correlate with the expected set of samples. And in col. 12, lines 25-36. This comparison will yield the optimum timing signal.).

The reference of Davies fails to specifically disclose c. obtaining an improved estimate of the deviation using the corrected received signal and the first estimate of the deviation.

However, Chen does. (See fig. 2: the output of element 220, and equation 6 & 7. Chen discloses a system that compensate for timing offsets. The timing error signal computed by timing error estimator is a function of the corrected received signal, which is the output of element 210, and the an estimate of the timing offset.

Therefore, taking the combined teachings of Davies and Chen as a whole. It would have been obvious to one of ordinary skill in the art to have modified the system of Davies, in the manner as claimed and as taught by Chen, for the benefit of providing an optimum timing error estimation.

Re claim 8, the combination of Davies and Chen further discloses that wherein at least one of the steps is embodied in a computer program product. (In Davies, see col. 11, lines 43-50)

Claim 10 is a system claim corresponding to method claim 1. Hence, the steps performed in method claim 1 would have necessitated the elements in system claim 10. Therefore, claim 10 has been analyzed and rejected w/r to claim 1.

Claim 17 is a system claim corresponding to method claim 1. Hence, the steps performed in method claim 1 would have necessitated the elements in system claim 17. Therefore, claim 17 has been analyzed and rejected w/r to claim 1.

5. Claims (2 & 11) are rejected under 35 U.S.C. 103(a) as being unpatentable over Davies et al (hereinafter Davies) and of Chen (US Publication 2005/0084025 A1), as applied to claim 1 above, and further in view of Yang (US Patent 7,016,404 B2).

Re claim 2, the combination of Davies and Chen further discloses that wherein the step of obtaining an expected signal corresponding to a probable deviation comprises the steps of: a. estimating a channel transfer function corresponding to the probable deviation (In Chen, see fig. 2: 260, and equation 6. The timing error signal is a function of the estimation of the channel. Please note that Hpm and Xpm are key elements in estimating the timing error signal.).

But, the combination of Davies and Chen fails to specifically disclose b. filtering the training sequence through the channel transfer function to obtain an expected signal corresponding to the probable deviation.

However, Yang does. (See fig. 3: 5 & 7, col. 4, line 65 – col. 5, line 20. Yang discloses a method for called "remodulation" which can be used to calculate a number of ideal, frequency-error-free data symbols on the basis of the training symbols. Remodulation of the training symbols with the channels coefficients is performed and illustrated in col. 5, line 20.

Therefore, taking the combined teachings of Davies, Chen, and Yang as a whole. It would have been obvious to one of ordinary skill in the art to have incorporated the step of remodulation into the system of Davies, as modified by Chen, and as taught by Yang, for the benefit of calculating frequency-error-free data symbols. (See col. 5, lines 7-9)

Claim 11 is a system claim corresponding to method claim 2. Hence, the steps performed in method claim 2 would have necessitated the elements in system claim 11. Therefore, claim 11 has been analyzed and rejected w/r to claim 2.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Davies et al (hereinafter Davies) and of Chen (US Publication 2005/0084025 A1), as applied t claim 1 above, and further in view of Morita et al (hereinafter Morita) (US Publication 2003/0179813 A1).

Re claim 4, the combination of Davies and Chen fails to specifically disclose that wherein the step of calculating the error factor is performed by calculating the square error between the expected signal corresponding to the probable deviation and corrected received signal shifted through the probable deviation.

However, Morita does. (See paragraph 50) Morita discloses a square error detecting section that detects the square error between the correlation value from magnification factor multiplying section and the ideal correlation value from time shifting section. The correlation value from magnification factor multiplying section corresponds to a correlation calculated using the reception signal that was transmitted by

transmission side apparatus as a transmission signal and a known signal similar to the known signal included in the reception signal. The output of the this correlation is passed through an averaging section which performs shifting average so as to compensate for the rapid level fluctuation of correlation value caused by fading.

Therefore, taking the combined teachings of Davies, Chen, and Morita as a whole. It would have been obvious to one of ordinary skill in the art to have incorporated the step of detecting the square error into the system of Davies, as modified by Chen, and as taught by Morita, for the benefit of detecting the synchronization time. (See paragraph 50)

Claim 13 is a system claim corresponding to method claim 4. Hence, the steps performed in method claim 4 would have necessitated the elements in system claim 13. Therefore, claim 13 has been analyzed and rejected w/r to claim 4.

Claims (5 & 14) are rejected under 35 U.S.C. 103(a) as being unpatentable over Davies et al (hereinafter Davies) and of Chen (US Publication 2005/0084025 A1), as applied to claim 1 above, in view of Baltersee et al (hereinafter Baltersee) (US Publication 2001/0014114 A1), and further in view of Ben-Eli (hereinafter Ben) (US Patent 6,400,784 B1).

Re claim 5, the combination of Davies and Chen fails to specifically disclose that where in the step of obtaining the improved estimate of the deviation comprises the steps of: a. calculating the correlation between the training sequence and the corrected

received signal shifted through a plurality of closely-spaced probable deviations, the plurality of closely-spaced probable deviations selected in the proximity of the first estimate of the deviation.

However, Baltersee does. (See fig. 2 & paragraphs 42 & 44) Baltersee discloses calculating the correlation between the training sequence (PN code 16) and the corrected received signal shifted through a plurality of closely-spaced probable deviations (the output of digital interpolator/decimator), the plurality of closely-spaced probable deviations selected in the proximity of the first estimate of the deviation. (the timing of the signal outputted from the digital interpolator/decimator has already been adjusted by the previous timing estimate supplied by the loop filter)

Therefore, taking the combined teachings of Davies, Chen, and Baltersee as a whole. It would have been obvious to one of ordinary skill in the art to have incorporated this feature into the system of Davies, as modified by Chen, and as taught by Baltersee, for the benefit of yielding the estimate of the timing delay. (See paragraph 44)

The combination of Davies, Chen, and Baltersee disclose the limitations as claimed above, except they do not specifically disclose b. identifying the closely-spaced probable deviation yielding the maximum correlation peak as the improved estimate of the deviation.

However, Ben does. (See fig. 2, col. 4, lines 6-9, 23-25) Ben discloses identifying the closely-spaced probable deviation yielding the maximum correlation peak

as the improved estimate of the deviation. Furthermore, the rough estimates are later used by the element 52 to refine the rough timing. (See col. 3, line 50-51)

Therefore, taking the combined teachings of Davies, Chen, Baltersee, and Ben as a whole. It would have been obvious to one of ordinary skill in the art to have incorporated this feature into the system of Davies, as modified by Chen and Baltersee, and as taught by Ben, for the benefit of determining the synchronization timing. (See col. 4, lines 23-25)

Claim 14 is a system claim corresponding to method claim 5. Hence, the steps performed in method claim 5 would have necessitated the elements in system claim 14. Therefore, claim 14 has been analyzed and rejected w/r to claim 5.

Allowable Subject Matter

6. Claims 6-9 and 15-16 are allowed.

7. The following is a statement of reasons for the indication of allowable subject matter. The art of record does not suggest the respective claim combinations together and nor would the respective claim combinations be obvious with:

Re claim 6, the further limitation of, *"A data-aided method of tracking the timing offset between a transmitted signal having a training sequence and a received signal using a pre-estimated timing offset, the method comprising the steps of: a. obtaining a corrected received signal using the received signal and the pre-estimated timing offset; b. obtaining a first estimate of the deviation in the pre-estimated timing offset out of a*

plurality of probable deviations by performing the steps of: i. de-convolving the corrected received signal shifted through the first probable deviation with the training sequence to obtain an estimated channel transfer function; ii. filtering the training sequence through the estimated transfer function to obtain an expected signal corresponding to the first probable deviation; iii. calculating an error factor between the expected signal and the corrected received signal shifted through the first probable deviation; performing steps i - iii for each probable deviation; and iv. identifying the probable deviation yielding the optimum value of error factor as the first estimate of the deviation; and c. obtaining an improved estimate of the deviation using the corrected received signal and the first estimate of the deviation". Claims 7 & 9 depend on claim 6.

Re claim 15, the further limitation of, *"A system for data-aided tracking of the timing offset between a transmitted signal having a training sequence and a received signal using a pre-estimated timing offset, the system comprising: a. a pre-corrector obtaining a corrected received signal using the received signal and the pre-estimated timing offset; b. a coarse estimator obtaining a first estimate of the deviation in the pre-estimated timing offset out of a plurality of probable deviations, the coarse estimator comprising: i. de-convolving block de-convolving the corrected received signal shifted through a probable deviation with the training sequence to obtain an estimated channel transfer function corresponding to the probable deviation; ii. a channel filter filtering the training sequence through the estimated channel transfer function to obtain an expected signal corresponding to the probable deviation; iii. an error calculator calculating an error factor between the expected signal corresponding to a probable deviation and the*

corrected received signal shifted through the probable deviation; and iv. a deviation selector identifying the probable deviation yielding the optimum value of error factor as the first estimate of the deviation; and c. a refiner obtaining an improved estimate of the deviation using the corrected received signal and the first estimate of the deviation".

Claim 16 depends on claim 15.

8. Claims (3 and 12) are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Re claim 3, the further limitation of, *"The method as recited in claim 2 wherein the step of estimating the channel transfer function corresponding to the probable deviation comprises de-convolving the corrected received signal shifted through the probable deviation with the training sequence".*

Re claim 12, the further limitation of, *"The system as recited in claim 11 wherein the channel estimator comprises a de-convolving block de-convolving the corrected received signal shifted through a probable deviation with the training sequence to obtain an estimated channel transfer function corresponding to the probable deviation".*

Contact

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Leon Flores whose telephone number is 571-270-1201. The examiner can normally be reached on Mon-Fri 7-5pm Alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Payne can be reached on 571-272-3024. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

LF
March 22, 2007

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SUPERVISORY PATENT EXAMINER